

**PRESCRIPTION DATA PROCESSING SYSTEM  
FOR DETERMINING NEW THERAPY STARTS**

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**BACKGROUND OF THE INVENTION**

The present invention is related to prescription drugs, and in particular, to a system and method for identifying new therapy starts for a patient based on aggregate information collected for a number of patients over a period of time.

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The pharmaceutical industry spends billions of dollars to promote new prescription drugs to physicians, dentists, etc., (collectively referred to as health care specialists) having permission from Drug Enforcement Agency (DEA) to prescribe them. A large portion of the industry's promotional spending budget is allocated to sales representatives and promotional messages. For example, using in-person selling techniques, a pharmaceutical sales representative attempts to persuade a health care specialist to prescribe a new medication (drug) for treating a patient with a particular new ailment or, alternatively, to switch to a new medication which is believed to be more effective than the old one in treating the existing condition.

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Typically, the sales representative meets a health care specialist and makes a presentation on the benefits of the new prescription drug, but unlike in standard retail sales, no immediate transaction takes place at the conclusion of the meeting. The success of the sales representative

or promotional message is determined only when the health care specialist initially treats the patient with the medication. In this situation, the health care specialist's prescribing behavior may have been affected by the sales representative or by the promotional message, and determining the impact of the sales technique and content is of utmost importance to the pharmaceutical companies. It enables them to optimize marketing strategies and to properly motivate and compensate their sales and marketing forces.

Conventionally, to evaluate the effectiveness of the sales force and promotional messages, newly prescribed drugs are detected on the basis of new prescriptions that may be represented by new pieces of paper. Namely, when presented with a new prescription on a piece of paper, a pharmacist enters information on the prescribed drug into a pharmacist's computer database. This entry is then treated by the pharmaceutical companies as a newly prescribed drug, a so-called new therapy or therapy start. In reality, however, the piece of paper submitted by the patient may have been the prescription for a previous drug, a so-called continuation therapy, presented to the pharmacist to renew or refill the existing medication.

Furthermore, if a patient for various reasons changes pharmacies to fill his/her prescriptions, it appears as if the new therapy has occurred with respect to that patient. That is, when the current pharmacy processes the current prescription, no information is conveyed to the pharmaceutical companies about the patient's previous prescriptions at another pharmacy or pharmacies. Thus, while the prescribed drug is actually a continuation therapy, the pharmaceutical companies are unaware of this situation and regard the prescription as a therapy start.

As explained above, the conventional collection of information on newly prescribed drugs suffers from several disadvantages. A need, therefore, exists for a system and method that overcome the above, as well as other, disadvantages of the conventional techniques.

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## SUMMARY OF THE INVENTION

It is an object of the present invention to accurately identify new drug therapies for a patient.

It is another object of the present invention to analyze the results and prepare reports on the basis of the drugs identified as new therapy starts.

It is yet another object of the present invention to detect any drug switching within a therapeutic category as undertaken by prescribers.

These and other objects, features and advantages are accomplished by a computer implemented method and system for processing prescription data representing a plurality of prescription drugs. According to the present invention, received prescription data that corresponds to a prescription drug is arranged into a new record of a predetermined format containing an identifier for identifying the patient and further containing a name of the prescription drug. Pre-stored records of the predetermined format are accessed, wherein each pre-stored record contains information on the prescription drugs previously prescribed for respective patients. The identifier in the new record is compared with each identifier located in the pre-stored records to find a matching pre-stored record associated with the patient. The name of the prescription drug is compared with another name of another prescription drug located in the found matching pre-stored record. The prescription drug is identified as newly prescribed for the patient if its name is not substantially identical to the other name.

In accordance with one aspect of the present invention, the predetermined format further contains a date of dispensing the prescription drug to the patient, and contains a dosage of the prescription drug. The last day is calculated when the patient has taken the other prescription based on the date of dispensing and on the dosage if the first and last names are substantially identical. A length of time is then determined that elapsed between the last day of taking the other prescription drug and a first day of dispensing the prescription drug. The prescription drug is identified as newly prescribed for the patient if the determined length of time exceeds a predetermined time interval.

In accordance with another aspect of the present invention, each pre-stored record is obtained for the patient. A list of illnesses is accessed to determine each illness treatable by each respective prescription drug contained in each pre-stored record. Also, the list of illnesses is accessed to determine an illness treatable by the first prescription drug identified as newly prescribed. Subsequently it is ascertained whether the first prescription drug is a replacement for another prescription drug previously taken by the patient.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

The above-mentioned as well as additional objects, features and advantages of the present invention will become readily apparent from the following detailed description thereof which is to be read in conjunction with the accompanying drawings, in which:

Fig. 1 is a block diagram of a prescription data processing system in accordance with one embodiment of the present invention;

Fig. 2 is a block diagram of a representative record generated by a computer server and stored in a database in the prescription data processing system;

Figs. 3A and 3B are flowcharts describing the operation of the prescription data processing system;

Fig. 4 is a flowchart illustrating various analysis operations and reports prepared by the prescription data processing system in accordance with one embodiment of the present invention;

5 Fig. 5 is a flowchart describing another feature of the prescription data processing system: therapy switching for patients.

In all Figures, like reference numerals represent the same or identical components of the present invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As a general overview, the present invention accurately detects any newly prescribed drug by generating records in a database providing unique identifying information for each prescribed drug, whether new or continuing. As the result of the uniquely generated records in the database, the operation of computer-implemented comparison to distinguish between a new therapy and a continuation therapy provides the identification of newly prescribed drugs.

One embodiment of the present invention will now be described in detail with reference to the accompanying figures. In particular, Fig. 1 shows a block diagram of a prescription data processing system in accordance with one embodiment of the present invention. Illustrated in Fig. 1 is a database 104 containing multiple records which will be described in detail below.

20 Connected to the database 104 is a computer server 100 for accessing the records stored in the database 104. The computer server 100 includes a programmable controller, such as a microprocessor 102, for controlling the read, write and other operations associated with the databases as known to those skilled in the art.

Also shown in Fig. 1 are databases 106, 108 illustrated in dashed lines. In another embodiment of the present invention, prescription patient histories may be distributed across several storage devices, such as the databases 104, 106, 108. In accordance with such embodiment, the computer server 100 controls the databases 104, 106 and 108, which all

5 maintain substantially the same structure for data records stored therein, to create an aggregate of the distributed prescription patient histories from all the records contained in the databases.

Further illustrated in Fig. 1 is a database 110 which has a different data structure than the other databases. The database 110 contains a list of substantially every drug in correspondence with illnesses for which the respective drug is prescribed.

Fig. 1 additionally shows pharmacies 112, 114, 116 containing computer systems 118, 120, 122, respectively, for entering data into locally associated databases 124, 126, 128, respectively. Prescription data is supplied, for example, by a pharmacist when presented in-person with a prescription for a drug. After being entered into the computer system 118, 120 or 122 and stored in the local database 124, 126 or 128, respectively, the prescription data is formatted and transferred to the computer server 100 for processing and storage in the remote databases 104, 106, 108 as described below. Alternatively, each computer system 118, 120, 122 in Fig. 1 may be comprised of a so-called "dumb" terminal that does not have any storage capabilities, so that the prescription data is supplied immediately to the computer server 100 without any additional processing (storage) at the pharmacy site. Furthermore, the prescription

20 data may be initially supplied to one or several data warehousing systems interposed between the pharmacies 112, 114, 116 and the computer server 100. After storing a predetermined amount of prescription data, the data warehousing systems send the prescription data at regular time intervals to the computer server 100.

Fig. 2 shows a block diagram of a representative record 200 generated by the computer server 100 and stored in any of the databases 104, 106, 108. The record 200 is generated for each prescribed drug having the following fields: Patient ID, Patient Zip Code, Patient ICD9 Code (medical information history, Drug Name, Drug Dosage, Date Dispensed, Prescriber Name, Prescriber Address, Prescriber DEA Number. It is understood, of course, that additional fields in each database record pertaining to the patient, drug or prescriber may be provided for storing additional if desired.

In accordance with one aspect of the present invention, Patient ID includes a patient identifier, such as a Social Security Number. Any other patient identifier may be used in the Patient ID field, including Patient Name, to uniquely identify the recipient of the prescribed drug. Other fields in the record 200 are self-explanatory and will not be described to avoid detracting from the inventive features of the present invention. It is understood, of course, that the prescriber is any health care specialist, such as physicians, dentists, etc., as mentioned above, with a valid DEA number or medial license.

The operation of the prescription data processing system will now be explained with reference to flowcharts shown in Figs. 3A and 3B. In step 300, a pharmacist receives a prescription, in paper, electronic or any other media form, for a particular drug from a customer and enters the prescription data, based on the received prescription, using any of the computer systems 118, 120, 122. In step 302, the prescription data received, for example, by the computer system 118 is transmitted to the computer server 100. Any form of data transmission is supported between the computer server 100 and the computer system 118 as known to those skilled in the art.

Further illustrated in Fig. 3A is step 304 in which the computer server 100 receives the transmitted prescription data and arranges the received prescription data into the record 200. Namely, the record 200 having information in the above-described fields is generated on the basis of the received prescription data. Then, the computer server 100 accesses, in step 306, the Patient ID field in the generated record. If the Patient ID field is empty as examined in step 308, the computer server 100 executes an error processing operation in step 310: the record 200 is rejected, or marked as incomplete or fraudulent, and the processing of the record 200 is terminated. It is understood that other error processing operations may be performed in addition to or in place of the above.

If, however, the Patient ID field in the record 200 contains a valid patient identifier as determined in step 308, the processing operations continue as shown in Fig. 3B. The list of records contains drugs prescribed during a predetermined time interval, such as the last two months for example. In step 314, the patient identifier in the new record is compared to the patient identifiers in the existing database records. Namely, all of the Patient ID fields in the existing database records are examined to determine an identity with the patient identifier in the new record. If there is no match as determined in step 316, the new record representing a newly prescribed drug is identified in the database as a new therapy in step 326. The new record is then added to the database in step 330 as shown in Fig. 3B.

If the match is found in step 316, the processing operation transitions to step 318, where the prescription drug name in the new record is compared with the prescription drug name in the database record with the same patient identifier.

As stated above, in step 318, the prescription drug names for the two records are compared to determine whether the drug names in the Patient ID fields match. In the operation



of step 320, the computer server 100 accesses the database 110 to determine the equivalency between the two drug names. For example, some drugs, even though prescribed in their brand names, are often replaced by substitute generic medications to reduce cost. In this situation, even though the drug on the prescription (piece of paper) is brand name, the generic equivalent is typically substituted for the brand name drug by the pharmacist unless the prescriber specifically requests no substitution on the prescription. It is important to note that as the result of such drug substitution, data on the prescribed drug supplied by the pharmacist pertains to the generic medication, as opposed to the brand name. According to one aspect of the present invention, the database 110 is accessed to obtain the equivalency between the brand and generic names of the drug as entered into the computer system 118 by the pharmacist.

Based on the drug equivalency processing using the database 110 as described above, if the equivalency between the drugs is established, then the new prescription record contains the prescribed drug that appears to be a continuation therapy. To confirm this finding, additional operations are performed as follows: the database record is examined for the date that the prescribed drug was dispensed to the patient and the drug dosage in step 322. In particular, information from the Date Dispensed and Drug Dosage fields is extracted. In step 322, the computer server 100 then calculates the last day that the prescribed drug should have been taken by the patient on the basis of the extracted information. Next, the Date Dispensed field is accessed in the new record, and the information likewise is extracted therefrom in step 322. In step 324, the computer server 100 then determines the length of time elapsed between the last day that the prescribed drug was taken by the patient, as determined on the basis of the existing database record, and the first day that the prescribed drug was given to the patient, as determined on the basis of the new record. If the two dates are separated by more than a predetermined time

interval, such as 60 days for example, the prescription drug in the new record is considered a new therapy in step 326 and is identified accordingly in the database 104. If, however, this predetermined time interval is not exceeded, then the prescription drug is a continuation therapy as processed in step 328. In any event, the processing of the new record is completed at that point.

Referring back to step 320, if the name of the drug in the new record is not equivalent to the names of drugs in the database records for this patient as determined in step 318, the new prescription is identified as a newly prescribed drug, that is, a new therapy start in step 326. This is indicated in the database record with a logical field (true/false) or any other means as known to those skilled in the art. Following step 326, the computer server adds the new record in step 330 as described above.

In another embodiment of the present invention, the computer server seeks the exact name equivalency between the prescribed drugs. Namely, the database 110 is not accessed to determine whether a particular generic drug has a brand name counterpart. Since only the exact name matches are considered in determining new therapies, this embodiment of the present invention provides a higher level of accuracy in evaluating the effectiveness of the direct sales techniques, promotional messages, etc.

In another aspect of the present invention, following the processing operations as described above, the newly prescribed drugs as identified by the operations of Figs. 3A and 3B are analyzed to evaluate the results. Fig. 4 is a flowchart illustrating the analysis operations in accordance with one embodiment.

In step 400, a time interval is selected during which the analysis of results, as obtained in accordance with the present invention and described above, is desired. In step 402,

the computer server 100 obtains all records for prescribed drugs identified as new starts during the time interval selected in step 400. Following the processing in step 402, the obtained records are sorted in step 404 according to the information contained in the Prescriber Name, Prescriber Address, and/or Patient Zip Code fields. In step 406, various reports are prepared on the basis of the above sort: the market share of new therapies for a particular drug; the penetration of new therapies in a particular geographic region; the receptiveness of a particular health care provider to new therapies. It is understood that a number of variations on the above, as well as other reports may be prepared by processing the records as described above. Such analysis reports provide tools for adjusting the sales and marketing strategies for new drugs, for accurately compensating the sales representatives, and for taking any other action as deemed by the pharmaceutical company.

Referring to Fig. 5, another feature of the present invention is described next. According to this feature, it is determined whether the newly prescribed drug is a replacement, a so-called therapy switch, for the drug previously given to the patient. In step 500, all records pertaining to a particular patient are accessed on the basis of the Patient ID and selected for further analysis. In step 502, the database 110 is accessed containing substantially all the prescribed drugs in correspondence with illnesses which are treatable by the respective drug. For each of the records selected in step 500 and for the newly prescribed drug, a list of illnesses which are treatable by those drugs is compiled on the basis of the information retrieved from the database 110. In step 504, the comparison is made between the drugs to determine whether the newly prescribed drug treats substantially the same illnesses in the patient as the previously prescribed drugs obtained from the selected database records. If a match is found, the newly prescribed drug is identified as a therapy switch in step 506, and the processing may then continue with steps of Fig. 4. This

added information on therapy switching provides an extra tool in identifying and recognizing the successful selling and marketing techniques.

Having described specific preferred embodiments of the invention with reference to the accompanying drawings, it is to be understood that the invention is not limited to those precise  
5   embodiments, and that various changes and modifications may be effected therein by one skilled in the art without departing from the scope or the spirit of the invention as defined in the appended claims.

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